4.6 Greenhouse Gas Emissions

This section of the PEIR describes the potential cumulative impacts of the 2008 Master Plan associated with the generation of greenhouse gases (GHG), climate change hazards, and compliance with applicable plans, policies, and regulations adopted for the purpose of reducing the emissions of GHG.

4.6.1 Environmental Setting

4.6.1.1 Global Climate Change Overview

Climate change refers to any substantial change in measures of climate (such as temperature, precipitation, or wind) lasting for decades or longer. According to the U.S. Environmental Protection Agency (USEPA), the Earth's climate has changed many times during the planet's history, with events ranging from ice ages to long periods of warmth. Historically, natural factors such as volcanic eruptions, changes in the Earth's orbit, and the amount of energy released from the sun have affected the Earth's climate. Some GHG, such as water vapor, occur naturally and are emitted to the atmosphere through natural processes, while others are emitted through human activities. Beginning late in the 18th century, human activities associated with the Industrial Revolution have changed the composition of the atmosphere and therefore very likely are influencing the Earth's climate. For over the past 200 years, the burning of fossil fuels, such as coal and oil, and deforestation has caused the concentrations of heat-trapping GHG to increase substantially in the atmosphere.

The accumulation of GHG in the atmosphere regulates the earth's temperature. Without the natural heat-trapping effects of GHG, the earth's temperature would be about 34 degrees Celsius (60 degrees Fahrenheit) cooler (California Climate Action Team [CCAT] 2007). However, it is believed that emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations.

The Global Carbon Project (2008) released an update of the global carbon budget for the year 2007. The atmospheric carbon dioxide (CO_2) concentration in 2007 was 383 parts per million (ppm), 37 percent above the concentration at the start of the Industrial Revolution (about 280 ppm in 1750). The 2007 concentration was the highest known atmospheric CO_2 concentration during the last 650,000 years and probably during the last 20 million years. Results show that anthropogenic CO_2 emissions have been growing about four times faster since 2000 than the previous decade. The annual mean growth rate of atmospheric CO_2 was 2.2 ppm per year in 2007, up from 1.8 ppm in 2006.

4.6.1.2 Greenhouse Gases

GHG are gases that trap heat in the atmosphere, analogous to the way a greenhouse retains heat. Common GHG include water vapor, CO_2, methane, nitrous oxides (N_2O), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), ozone, and aerosols. Global atmospheric concentrations of CO_2, methane and nitrous oxides have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years.

Individual GHG have varying potential to contribute to global warming and atmospheric lifetimes. Table 4.6-1 identifies the global warming potentials and atmospheric lifetimes of basic GHG. The reference gas for global warming potential is CO_2. GHG emissions and global warming potentials are compared in relation to CO_2. The CO_2 equivalent (CO_2e) is a consistent methodology for comparing GHG emissions since it normalizes various GHG emissions to a consistent measure. CO_2 has a global warming potential of one; by comparison, the global warming potential of methane is 21. This means that methane has a greater global warming effect than CO_2 on a molecule per molecule basis. One million metric tons (MT) of CO_2e represents the emissions of an individual GHG multiplied by its global warming potential.

Table 4.6-1 Global Warming Potentials and Atmospheric Lifetimes of Basic GHGs

GHG	Formula	100-year global warming potential[1]	Atmospheric lifetime (yrs)
Carbon dioxide	CO_2	1	50-200
Methane	CH_4	21	12
Nitrous oxide	N_2O	310	114
Sulphur hexafluoride	SF_6	23,900	3,200

(1) The warming effects over a 100-year time frame relative to other GHG.
Source: USEPA 2011

State law defines GHGs to include the following compounds: CO_2, methane, nitrous oxides, HFCs, PFCs, and SF_6 (Health and Safety Code [HSC] Section 38505(g)). Descriptions of these compounds and their sources are provided below.

Carbon Dioxide (CO_2)

CO_2 enters the atmosphere through the burning of fossil fuels (e.g., oil, natural gas, and coal), solid waste, and trees and wood products, and as a result of other chemical reactions, such as those required to manufacture cement. Globally, the largest source of CO_2 emissions is the combustion of fossil fuels such as coal, oil, and gas in power plants, automobiles, industrial facilities, and other sources. A number of specialized industrial production processes and product uses such as mineral production, metal production, and the use of petroleum-based products can also lead to CO_2 emissions. CO_2 is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle. Natural sources of CO_2 that occur within the carbon cycle where billions of tons of atmospheric CO_2 are removed from the atmosphere by oceans and growing plants, also known as 'sinks,' and are emitted back into the atmosphere annually through natural processes, also known as 'sources.' When in balance, the total CO_2 emissions and removals from the entire carbon cycle are roughly equal. Since the Industrial Revolution in the 1700s, human activities, including burning of oil, coal and gas and deforestation, have increased CO_2 concentrations in the atmosphere. In 2005, global atmospheric concentrations of CO_2 were 35 percent higher than they were before the Industrial Revolution (USEPA 2010).

Methane (CH_4)

Methane is emitted from a variety of both human-related and natural sources. Human-related activities include fossil fuel production, animal husbandry, rice cultivation, biomass burning, and waste management. Methane is emitted during the production and transport of coal, natural gas, and oil.

Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills. It is estimated that 60 percent of global methane emissions are related to human-related activities. Natural sources of methane include wetlands, gas hydrates, permafrost, termites, oceans, freshwater bodies, non-wetland soils, and other sources, such as wildfires. Methane emission levels from a particular source can vary significantly from one country or region to another, depending on many factors such as climate, industrial and agricultural production characteristics, energy types and usage, and waste management practices. For example, temperature and moisture have a significant effect on the anaerobic digestion process, which is one of the key biological processes that cause methane emissions in both human-related and natural sources. Also, the implementation of technologies to capture and utilize methane from sources such as landfills, coal mines, and manure management systems affects the emission levels from these sources (USEPA 2010).

Nitrous Oxide (N_2O)

Nitrous oxide, more commonly known as "laughing gas," is produced naturally by microbial processes in soil and water. In addition to agricultural sources, some industrial processes, such as fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions, also contribute to its atmospheric load. It is used in rocket engines, racecars, and as an aerosol spray propellant. Global concentration of nitrous oxide in 1998 was 314 parts per billion (ppb) (USEPA 2010).

Fluorinated Gases

HFCs, PFCs, and SF_6 are synthetic, powerful GHG that are emitted from a variety of industrial processes, including aluminum production, semiconductor manufacturing, electric power transmission, magnesium production and processing, and the production of Chlorodifluoromethane (HCFC-22), commonly used in air conditioning applications. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances, such as CFCs, Hydrochlorofluorocarbons (HCFCs), and halons. These gases are typically emitted in smaller quantities, but have higher global warming potential than other GHGs (USEPA 2011).

4.6.1.3 Global, National, Statewide, Countywide and VWD GHG Inventories

In an effort to evaluate and reduce the potential adverse impact of global climate change, international, state and local organizations have conducted GHG inventories to estimate their levels of GHG emissions and removals. The following summarizes the results of these GHG inventories for global, national, state, countywide and current facility operations for the VWD.

Global

Worldwide anthropogenic emissions of GHG in 2006 were approximately 49,000 million MT CO_2e, including ongoing emissions from industrial and agricultural sources and emissions from land use changes (i.e., deforestation, biomass decay) (Intergovernmental Panel on Climate Change [IPCC] 2007). CO_2 emissions from fossil fuel use accounts for 56.6 percent of the total emissions of 49,000 million MT CO_2e (includes land use changes) and all CO_2 emissions are 76.7 percent of the total. Methane emissions account for 14.3 percent and nitrous oxides emissions for 7.9 percent of GHG (IPCC 2007).

United States

The USEPA publication, *Draft Inventory of U.S. GHG Emissions and Sinks: 1990-2009,* provides a comprehensive emissions inventory of the nation's primary anthropogenic sources and sinks of GHG. Overall, total U.S. emissions had risen by 13 percent from 1990 to 2008, while the U.S. gross domestic product (GDP) had increased by 65 percent over the same period. Emissions decreased from 2008 to 2009, decreasing by six percent to 6,640 million MT CO_2e. GDP also decreased by three percent from 2008 to 2009. The publication indicated that the following factors were primary contributors to this decrease: 1) a decrease in economic output resulting in a decrease in energy consumption across all sectors; and 2) a decrease in the carbon intensity of fuels used to generate electricity due to fuel switching as the price of coal increased, and the price of natural gas decreased significantly (USEPA 2011).

California

The state of California is a substantial contributor of GHG as it is the second largest contributor in the U.S. and the 16th largest in the world. According to the California Air Resources Board (CARB), California generated 484 million MT CO_2e in 2004. According to the CARB, GHG emissions in California are mainly associated with fossil fuel consumption in the transportation sector (38 percent). The industrial sector is the second-largest source of GHG emissions (20 percent). Electricity production, from both in-state and out-of-state sources, agriculture, forestry, commercial, and residential activities comprise the balance of California's GHG emissions. Emissions of GHG were offset slightly in 2004 by the sequestration (intake) of carbon within forests, reducing the overall emissions by 4.7 million MT CO_2e, resulting in net emissions of about 480 million MT CO_2e.

San Diego County

In addition to the California GHG Inventory, a more specific county-wide GHG inventory was prepared by the University of San Diego School of Law Energy Policy Initiative Center (EPIC) in 2008. This San Diego County GHG Inventory (SDCGHGI) is a detailed inventory that considers the unique characteristics of the region in calculating emissions. In 2006, a total of 34.4 million MT CO_2e was generated by the county of San Diego. This total includes both the incorporated and unincorporated areas. The largest contributor of GHG was from the on-road transportation category, which comprised 46 percent (16 million MT CO_2e) of the total amount. The second highest contributor was the electricity category, which contributed 9 million MT CO_2e, or 25 percent of the total. Together the on-road transportation and electricity category comprised 71 percent of the total GHG emissions for the San Diego region. The remaining amount was contributed by natural gas consumption, civil aviation, industrial processes, off-road transportation, waste, agriculture, rail, water-borne navigation, and other fuels.

Vallecitos Water District Facilities

Sources of GHGs from VWD include indirect emissions from the consumption of electricity (pump and lift stations, security lighting, computerized monitoring systems) and direct emissions produced on VWD property from stationary combustion sources (emergency generators) and mobile sources (VWD-owned vehicles). VWD facilities also include the district offices, which would generate GHG emissions from electricity and natural gas use, and vehicle trips to and from the office. However, since no changes to the offices or staffing are proposed in the Master Plan, GHG emissions from the office would be the same under existing and proposed conditions and the offices are not included in this analysis. As shown in Table 4.6-2, VWD emits an average of 1,426 MT CO_2e in GHG per year when considering both direct and indirect emission sources. From electricity consumption, VWD emits an average of 1,153 MT CO_2e in GHG per year. From diesel combustion from emergency generators, VWD emits an average of 89 MT CO_2e in GHG per year. From VWD-owned vehicle trips for facility maintenance, VWD emits an average of 184 MT CO_2e in GHG per year. Electricity usage related to pump and lift stations represents 80 percent of the VWD GHG emission sources, mobile sources represent thirteen percent of VWD GHG emissions and stationary sources represent seven percent of VWD GHG emissions.

Table 4.6-2 Average Annual VWD GHG Emissions (2007)

Source	Annual Emissions (metric tons)	
	metric tons CO_2e	**Percent of Total Emissions**
Indirect Sources		
Electricity Usage (pump and lift stations)[1,2]	1,153	80
Direct Sources		
Stationary (Generators)[3]	89	7
Mobile (VWD vehicles)[4]	184	13
Total GHG Emissions	**1,426**	**100%**

Sources:
(1) Table C.1 Comparison of GWPs from the IPCC's 2nd and 3rd TAR, App. C of the CCAR General Reporting Protocol (GAR), Ver. 3.1, Jan. 2009; Table C.2: CO2, CH4, and N2O Electricity Emission Factors by eGRID Subregion, Subregion CAMX, App C of the CCAR GAR, Ver. 3.1, Jan. 2009.
(2) The existing reservoirs result in the consumption of minor amounts of electricity for computerized monitoring and lighting, generally less than 400 kWH per month, compared to a minimum of 1,800 kWH required in one month at the smallest pump station, and a maximum of 52,540 kWH in one month at the pump station requiring the most energy. Due to its small contribution to energy use, reservoir energy usage is not included in the VWD's electricity demand.
(3) USEPA 2008. Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance - Indirect Emissions From Purchase/Sales of Electricity and Steam
(4) Table C.4: CH4 and N2O Emission Factors for Highway Vehicles by Model Year (g/mile),CCAR GAR, Version 3.1, January 2009 (Assume Model year 2005-present, gasoline fueled); URBEMIS 2007, version 9.2.4.

4.6.1.4 Regional Adverse Effects of Climate Change

The San Diego Foundation's Regional Focus 2050 Working Paper and Technical Assessment explored what the San Diego region would be like in the year 2050 if current climate change trends continue. The paper projected potential adverse effects on the San Diego region related to climate, energy needs, public health, wildfires, water supply, sea level, and ecosystems. The climate model simulations exhibited warming across San Diego County, ranging from about 1.5 °F to 4.5 °F, particularly in inland areas. Temperature changes for areas along the coast would be moderated by the influence of the Pacific Ocean. The increase in peak demand for electricity for cooling could result in blackouts and power outages without adequate planning. With an aging population, extreme-heat conditions in the San Diego region are also a public health concern. Other health concerns include increased ozone air pollution levels due to an increase in sunny days, which can exacerbate asthma and other respiratory and cardiovascular diseases; increased fire-related injuries and death as intense wildfires occur more frequently; and coastal algal blooms, which can harbor toxic bacteria and other diseases. Drought years might occur as much as 50 percent more often and be considerably drier. Even with plans in place to conserve, recycle, and augment our available water, it is estimated San Diego County could face an 18 percent shortfall in water supply by 2050. Rising sea levels will have a major impact on the San Diego region's environment and economy, particularly in coastal areas. High tide flooding will threaten low-lying coastal communities and impact military, port and airport operations. High surf events and rising sea levels will cause even greater coastal erosion. Climate change will also add to the pressures on the variety of habitats and species in the county. The locations where environmental conditions are suitable for a particular species will shift with climate change. To survive, some animals and plants will have to relocate to find new habitat or potentially face extinction.

4.6.2 Regulatory Framework

4.6.2.1 Federal

Clean Air Act

The Clean Air Act (CAA) of 1970 and the CAA Amendments of 1971 required the USEPA to establish National Ambient Air Quality Standards (NAAQS) with states retaining the option to adopt more stringent standards or to include other specific pollutants. On April 2, 2007, the Supreme Court found that CO_2 is an air pollutant covered by the CAA; however, no NAAQS have been established for CO_2.

Final Mandatory Reporting of GHG Rule

In September 2009, the USEPA issued the Final Mandatory Reporting of GHG Rule. The rule requires reporting of GHG emissions from large sources and suppliers in the United States, and is intended to collect accurate and timely emissions data to inform future policy decisions. Under the rule, suppliers of fossil fuels or industrial GHG, manufacturers of vehicles and engines, and facilities that emit 25,000 MT or more per year of GHG emissions are required to submit annual reports to USEPA. The USEPA estimates that the rule covers about 10,000 facilities nationwide, accounting for about 85 percent of GHG emissions in the United States.

4.6.2.2 State

Executive Order S-3-05

California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S-3-05, the following GHG emission reduction targets:

1. By 2010, California shall reduce GHG emissions to 2000 levels;
2. By 2020, California shall reduce GHG emissions to 1990 levels; and
3. By 2050, California shall reduce GHG emissions to 80 percent below 1990 levels.

The first CCAT Report to the Governor in 2006 contained recommendations and strategies to help meet the targets in Executive Order S-3-05. The latest CCAT Biennial Report was released in April 2010. It expands on the policy oriented 2006 assessment. This report provides new information and scientific findings. The new information and details in the CCAT Assessment Report include development of new climate and sea-level projections using new information and tools that have become available in the last two years; and evaluation of climate change within the context of broader social changes, such as land-use changes and demographic shifts (CCAT 2010). The action items in the report focus on the preparation of the Climate Change Adaptation Strategy, required by Executive Order S-13-08.

Assembly Bill 32, the California Global Warming Solutions Act of 2006

In September 2006, the California State Legislature adopted Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 focuses on reducing GHG emissions in California. GHGs as defined under AB 32 include CO_2, methane, nitrous oxide, HFCs, perfluorocarbons, and sulfur hexafluoride. Under AB 32, the CARB has the primary responsibility for reducing GHG emissions and managing the CCAT to coordinate statewide efforts and promote strategies that can be undertaken by many other California agencies. AB 32 requires the CARB to adopt rules and regulations that would achieve GHG emissions equivalent to state-wide levels in 1990 by 2020. In general, AB 32 directs the CARB to do the following:

1. Make publicly available a list of discrete early action GHG emission reduction measures that can be implemented prior to the adoption of the statewide GHG limit and the measures required to achieve compliance with the statewide limit;
2. Make publicly available a GHG inventory for the year 1990 and determine target levels for 2020;
3. On or before January 1, 2010, adopt regulations to implement the early action GHG emission reduction measures;
4. On or before January 1, 2011, adopt quantifiable, verifiable, and enforceable emission reduction measures by regulation that will achieve the statewide GHG emissions limit by 2020, to become operative on January 1, 2012, at the latest. The emission reduction measures may include direct emission reduction measures, alternative compliance mechanisms, and potential monetary and non-monetary incentives that reduce GHG emissions from any sources or categories of sources that the CARB finds necessary to achieve the statewide GHG emissions limit; and
5. Monitor compliance with and enforce any emission reduction measure adopted pursuant to AB 32.

Regarding the first two bullets, the CARB has already made available a list of discrete early action GHG emission reduction measures. The CARB has also published a staff report titled *California 1990 GHG Emissions Level and 2020 Emissions Limit* (CARB 2007a) that determined the statewide levels of GHG emissions in 1990. The CARB identified 427 million MT CO_2e as the total statewide aggregated GHG 1990 emissions level and 2020 emissions limit. Additionally, in December 2008, the CARB adopted the Climate Change Scoping Plan, which outlines the state's strategy to achieve the 2020 GHG limit. This Scoping Plan proposes a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify energy sources, save energy, create new jobs, and enhance public health. The plan emphasizes a cap-and-trade program, but also includes the discrete early actions.

Senate Bill 97

Senate Bill (SB) 97, enacted in 2007, amends the CEQA statute to clearly establish that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis. It directed the California Office of Planning and Research (OPR) to develop draft CEQA Guidelines for the mitigation of GHG emissions or the effects of GHG emissions. On December 30, 2009, the Natural Resources Agency adopted CEQA Guidelines amendments, which provide regulatory guidance with respect to the analysis and mitigation of the potential effects of GHG emissions.

Executive Order S-13-08

On November 14, 2008, Governor Schwarzenegger issued Executive Order S-13-08, the Climate Adaptation and Sea Level Rise Planning Directive, which provides direction for how the state should plan for future climate impacts. Executive Order S-13-08 calls for the implementation of four key actions to reduce the vulnerability of California to climate change:

1. Initiate California's first statewide Climate Change Adaptation Strategy (CAS) that will assess the state's expected climate change impacts, identify where California is most vulnerable and recommend climate adaptation policies;
2. Request that the National Academy of Sciences establish an expert panel to report on sea level rise impacts in California in order to inform state planning and development efforts;
3. Issue interim guidance to state agencies for how to plan for sea level rise in designated coastal and floodplain areas for new and existing projects; and
4. Initiate studies on critical infrastructure projects and land-use policies vulnerable to sea level rise.

The 2009 CAS report summarizes the best known science on climate change impacts in the state to assess vulnerability and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. This is the first step in an ongoing, evolving process to reduce California's vulnerability to climate impacts (California Climate Change Portal 2010).

California Code of Regulations Title 24, Part 6

Although it was not originally intended to reduce GHG emissions, California Code of Regulations (CCR) Title 24, Part 6: *California's Energy Efficiency Standards for Residential and Nonresidential Buildings* were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. Electricity production by fossil fuels results in GHG emissions and energy efficient buildings require less electricity. Therefore, increased energy efficiency results in decreased GHG emissions.

Senate Bill 375

SB 375, approved by the governor on September 30, 2008, requires metropolitan planning organizations (MPOs) to include sustainable communities strategies (SCS), as defined, in their regional transportation plans (RTPs) for the purpose of reducing GHG emissions, aligns planning for transportation and housing, and creates specified incentives for the implementation of the strategies. Specifically, this bill makes findings and declarations concerning the need to make significant changes in land use and transportation policy in order to meet the GHG reduction goals established by AB 32. SB 375 also requires ARB to develop regional GHG emission reduction targets to be achieved from the automobile and light truck sectors for 2020 and 2035 by September 30, 2010. The 18 Metropolitan Planning Organizations in California will prepare a SCS to reduce the amount of vehicle miles traveled in their respective regions and demonstrate the ability for the region to attain ARB's targets. Within eight years cities will be required to update housing plans required by the state.

The ARB Regional Targets Advisory Committee (RTAC), which was appointed in January 2009 to help address the requirements of Senate Bill (SB) 375, was tasked with recommending a method by which each major region of the state could reduce GHG emissions through more sustainable land use and transportation planning. After approximately 13 public meetings in Sacramento, the RTAC, in its September 29, 2009 report, recommended that regional targets be expressed as a percent per-capita GHG emission reduction from a 2005 base year. This differs from the 1990 base year established in AB 32 due to a lack of reliable regional transportation and land use data from 1990 (according to the RTAC). The RTAC also recommended ARB use an interactive process with the regional Metropolitan Planning Organizations, such as the San Diego Association of Governments (SANDAG), to set a single statewide uniform target that could be adjusted up or down to respond to regional differences. The targets may be expressed in gross MT, MT per capita, MT per household, or in any other metric deemed appropriate by ARB, and were to be presented to the ARB Board by September 2010.

SANDAG is currently preparing its SCS as an element of the 2050 Regional Transportation Plan. A framework for the SCS has been developed and was presented to the public in October 2010.

4.6.3 Master Plan Impacts and Mitigation

The following section addresses potential impacts relating to GHG that could result due to the proposed Master Plan. Due to the nature of assessment of GHG emissions and the effects of climate change, impacts can currently only be analyzed from a cumulative context. Individual projects are generally of insufficient magnitude by themselves to influence climate change or result in a substantial contribution to the global GHG inventory. Thus GHG impacts are recognized as exclusively cumulative impacts; there are no non-cumulative GHG emissions impacts from a climate change perspective (CAPCOA 2008). Accordingly, discussion of the proposed Master Plan's GHG emissions and its impact on global climate are addressed in terms of the proposed Master Plan's contributions to a cumulative impact on the global climate.

4.6.3.1 Direct and Indirect Generation of GHG and Consistency with Applicable Plans Adopted for Reducing GHG

Greenhouse Gas Emissions Cumulative Summary

Would implementation of the 2008 Master Plan generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment, or that would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHG?

Cumulative Impact	Significant?	Proposed Master Plan Contribution
Net increase of GHG emissions that would exceed the screening thresholds.	Yes	Not cumulatively considerable.

Standards of Significance

Based on Appendix G of the CEQA Guidelines and adopted GHG significance thresholds in other jurisdictions (such as the BAAQMD), the VWD has determined that the 2008 Master Plan would result in a significant impact if it would result in a net increase of more than 1,100 metric tons (MT) CO_2e emissions annually over baseline conditions.

Although the BAAQMD does not consider construction emissions to be significant, the VWD has chosen to include construction emissions when assessing annual GHG emission levels. Construction emissions would cease upon completion of the CIP Master Plan projects; however, they would result in a one-time contribution to the global GHG inventory. To determine the significance of GHG emissions during construction, construction emissions would be amortized over the lifetime of the project and added to annual operational emissions. The lifetime of the project is assumed to be 30 years. This methodology and lifetime assumption is consistent with the recommendations of other jurisdictions, including the County of San Diego Department of Planning and Land Use (County of San Diego 2010) and the South Coast Air Quality Management District (SCAQMD 2009).

The above threshold was determined to be applicable by the VWD, based on its independent review and consideration of the adopted thresholds of the BAAQMD. Similar to the San Diego Air Basin (SDAB), the San Francisco Bay Area Air Basin (SFBAAB) includes a mix of urban and rural land uses, with large urban centers like downtown San Diego and the city of San Francisco. Additionally, the majority of emissions in both air districts are from vehicular sources. The climate in both basins is dominated by a by a semi-permanent high pressure cell located over the Pacific Ocean, with northwesterly prevailing winds. Almost all of the annual precipitation in either basin falls between late fall and early spring (BAAQMD 2011). Section 15064.4 (b) of the CEQA Guidelines states that a lead agency should consider the following factors when assessing the significance of impacts from GHG emissions on the environment:

1. The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting;
2. Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.
3. The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

Additionally, Section 15064.4(a) of the CEQA Guidelines states that the determination of the significance of GHG emissions should rely on a qualitative analysis or performance based standards.

The significance threshold is consistent with the first and third considerations because the BAAQMD determined a significance threshold of 1,100 MT CO_2e based on the existing environmental setting and future compliance with regulations pertaining to GHG emissions, such as AB 32. The threshold is consistent with the second consideration because it establishes a numeric threshold for comparison to the project's GHG emissions. The VWD has analyzed and independently reviewed this information and has determined that the thresholds of significance comply with Section 15064.4(a) of the CEQA Guidelines because the thresholds require a qualitative analysis and establish performance based standards.

Impact Analysis

By definition, the impacts to and from climate change are cumulative. The 2008 Master Plan would participate in this potential impact through its incremental contribution combined with the cumulative increase of all other sources of GHGs, which when taken together form global climate change impacts.

An inventory of the three most common GHG emissions (CO_2, methane, and nitrous oxides) likely to be emitted by VWD projects is presented below. The emissions of the individual gases were estimated and then converted to their CO_2e in MT using the individually determined GWP of each gas. The analysis methodology used for the inventory assumes a “business as usual” scenario for the 2008 Master Plan.

Construction Emissions

Construction of CIP projects proposed under the 2008 Master Plan would result in temporary emissions of GHG from the operation of construction equipment and from worker and building supply vendor vehicles. Equipment that would be associated with construction of the proposed CIP projects includes dozers, rollers, dewatering pumps, backhoes, loaders, delivery, and haul trucks. GHG emissions for construction were based on the assumptions listed for the worst-case daily construction scenario described in Section 4.1.3.2, Issue 2 – Consistency with Air Quality Standards, of this PEIR. These calculations were used as the basis for extrapolating the GHG emissions that would occur from construction of every project in the 2008 Master Plan. Assumptions and calculations are provided in the “Estimated GHG Emissions from CIP Project Construction” spreadsheet provided in Appendix E.

The total GHG emissions that would result from construction of the CIP projects for the buildout of the entire Master Plan are provided in Table 4.6-3. GHG emissions associated with construction of the CIP projects would contribute approximately 7,178 MT CO_2e to the regional GHG inventory over the lifetime of the 2008 Master Plan. To determine the contribution of construction emissions to the total annual GHG emissions associated with the Master Plan, GHG emissions from construction are amortized over the lifetime of the proposed Master Plan, which is assumed to be 30 years. Therefore, construction of the Master Plan would contribute 239 MT CO_2e to the total annual emissions associated with operation of the Master Plan, discussed below.

Table 4.6-3 Estimated GHG Emissions for CIP Project Construction

Emission Source	GHG Emissions (Metric Tons CO_2e)
Pipeline Projects (Sewer, Potable, and Land Outfall)	4,966
Pump Station Projects	453
Reservoir Projects	1,452
Lift Station Project	307
Total Construction Emissions for entire buildout of Master Plan	**7,178**
Amortized Annual Construction Emissions*	**239**

Source: URBEMIS 2007
* Amortization is based on 30 year buildout of 2008 Master Plan.

Operational Emissions

Operational GHG emissions from the CIP projects would include indirect emissions from electricity usage (reservoirs, pump and lift stations), and direct emissions from mobile (vehicle trips associated with facility maintenance) and stationary sources (fuel combustion from emergency generators). In the 2008 Master Plan, the only CIP projects that may generate stationary operational GHG emissions would be pump and lift stations. Pipeline projects and storage (reservoir) projects, once constructed, would not require substantial demands of electricity and would not require the use of emergency generators or any other fuel-consuming operating equipment. The new reservoirs would result in new security lighting and would require some electricity to operate computerized monitoring systems. Solar panels are used to power the security lighting at some existing reservoirs and would be utilized at new reservoirs where traditional power sources are not available. Additionally, as listed in the Project Design Features in Section 3.3.5.5, 2008 Master Plan CIP projects will use high-intensity discharge outdoor lighting and lighting controls such as timers or motion detectors. New computerized monitoring systems would require minimal electricity and would not substantially increase energy usage compared to energy required for existing monitoring systems. Operation of lighting and the monitoring systems at the existing reservoirs demand less than 400 kWH of electricity per month. The 2008 Master Plan proposes five new reservoirs, which would result in a monthly consumption of less than 2,000 kWH. This amount of electricity is minimal compared to the electricity demand generated by the new pump and lift stations, discussed below. Therefore, new reservoirs would not result in new GHG emissions.

Electricity Usage

As discussed above, the new reservoirs and pipeline CIP projects would result in negligible GHG emissions once constructed. However, the 2008 Master Plan includes eight pump station CIP projects and one lift station CIP project that would have the potential to generate new GHG emissions from electricity use. Of the eight CIP pump station projects, three would construct entirely new pumps (PS-1, PS-2, PS-4) and five would replace old pumps with new pumps (PS-3, PS-5, PS-6, PS-7, PS-8). The construction of CIP pump station projects would occur during Phases 2, 3 and 5. The one CIP lift station project (SB-1) would occur during Phase 3 and replace the existing lift station.

The electricity usage of the proposed 2008 Master Plan pump and lift stations was estimated based on the average monthly electricity consumption of existing VWD pump and lift stations (see Section 4.4, Energy), which includes operation of the pumps and other equipment at the station that requires electricity, such as lighting. The projected average monthly electricity consumption was then used to calculate the annual GHG emissions for the proposed pump and lift stations. Implementation of the 2008 Master Plan CIP projects would result in a total estimated average monthly consumption of 308,220 kWh of electricity. The existing pump stations and lift station that would be replaced currently consume 155,217 kWh of electricity every month; therefore, the CIP pump stations and lift station would generate a net increase of 153,003 kWh. The information in Table 4.6-4 serves as a guide for the likely net increase in annual GHG emissions of the 2008 Master Plan from electricity usage. However, it is possible that actual annual GHG emissions of each proposed pump or lift station may vary from this estimate once in operation. As described previously, proposed pump and lift stations vary both in size (firm capacity) and in frequency of use. Some pump and lift stations would be in operation more than others, due to the location and the overall demand of the local customer base, which would influence the monthly electricity consumption and GHG emissions of each pump station. Using these assumptions, the estimated GHG emissions for the 2008 Master Plan pump and lift stations is 606 MT CO_2e.

Table 4.6-4 Estimated Annual Net Increase in VWD GHG Emissions for Proposed CIP Pump and Lift Stations

Source	Annual Emissions (metric tons)	
	CO_2e	Percent of Total Emissions
Indirect Sources		
Electricity Usage	606	67%
Direct Sources		
Diesel Usage (Emergency Generators)	10	1%
Mobile (Vehicular Use)	56	6%
Construction Emissions (Amortized)	239	26%
Total Indirect and Direct	**911**	**100%**

Source: PBS&J 2010

Diesel Usage

The only source of diesel fuel usage in the 2008 Master Plan would be from standby emergency generators. These generators would only be used for CIP pump and lift station projects and would only be operated for regular testing or during an emergency. Emergency generators are tested by VWD approximately 20 minutes per month per generator. Additionally, once per year VWD disables all pumps on all facilities and operates pump and lift stations with emergency generators for two hours to test the emergency system functionality. The maximum capacity of the existing emergency generators is 470 horsepower, which converts to 1.12 million British thermal units (Btu). The proposed Master Plan would result in five new emergency generators: one at each new pump station, one at a replacement pump station, and one at the replacement lift station. Using these assumptions, the estimated 2008 Master Plan GHG emissions from stationary sources is 10 MT CO_2e.

Mobile Sources

Mobile sources of GHG emissions for the 2008 Master Plan would be primarily associated with vehicular trips by employees. However, operation of projects proposed under the 2008 Master Plan would not generate a significant volume of new vehicle trips. The CIP projects that involve replacing existing pump stations and a lift station would not generate a net increase in new vehicle trips because these facilities currently generate maintenance trips. Based on the maintenance trips required for the existing VWD facilities, the new reservoirs and pump stations would require approximately one round trip per day, plus an additional trip if repairs are needed. The new land outfall projects would require approximately one round trip per week. The new pipelines would only require trips during rain events, and only to trouble spots along the pipeline. For the purposes of this analysis, it was assumed that a maximum of four rain events would occur each month and five trouble spots would require trips. Using these assumptions, it is estimated that the proposed CIP projects would result in 44 daily trips, and would result in annual GHG emissions of 56 MT CO_2e.

As shown in Table 4.6-4, the total net increase in annual direct and indirect GHG emissions from construction and operation of the CIP projects in the 2008 Master Plan is estimated to be 911 MT CO_2e per year. This estimate represents business-as-usual emissions and does not take into consideration any GHG-reducing project features that would be implemented in the CIP projects. The majority of the GHG emissions would be from electricity usage (67 percent). Amortized annual construction emissions account for 26 percent. GHG emissions from mobile sources and stationary sources represent about six percent and one percent. Therefore, the GHG emissions associated with the proposed Master Plan would not exceed the significance threshold of 1,100 MT CO_2e being used by VWD and this impact would be less than significant.

Consistency with Applicable GHG Reduction Measures

The CCAT, established by Executive Order S-3-05 has recommended strategies to reduce GHG emissions at a statewide level to meet the goals of the executive order. However, the majority of these measures are not applicable at the individual project level. The 2008 CAPCOA report, "CEQA and Climate Change," includes numerous GHG reducing measures that can be applied to individual projects. Further, the California Attorney General's Office has also published a list of recommendations of GHG reducing measures. Currently, estimates for GHG emission reductions as a result of implementation of these measures are only available for the CAPCOA measures. CAPCOA provides some basic estimates of GHG emission reductions that may be expected with incorporation of measures listed in Appendix B, Table 16 of the January 2008 report, *CEQA and Climate Change*. It should be noted that reduction estimates vary widely and not all recommended measures have reduction estimates associated with them.

Even though the proposed Master Plan would not exceed the significance threshold and would not result in a significant impact related to GHG emissions, the proposed Master Plan would also implement energy-saving project features that would reduce GHG emissions below the estimated emissions in Table 4.6-4. Table 4.6-5 includes a comparison of the consistency of the 2008 Master Plan CIP project features, listed in Section 3.3.5.5, with measures recommended by the CAPCOA, as well as the estimated emission reduction for the measure. The project features, including installation of energy efficient appliances and lighting would reduce GHG emissions from energy use by approximately four percent. Table 4.6-6 provides the approximate reduction in GHG emissions from the Master Plan associated with implementation of these project features. The measures listed in Table 4.6-5 would reduce business as usual Master Plan emissions by 2.6 percent, for total annual emissions of 887 MT CO_2e. As discussed above, the CIP projects would not generate more than 1,100 MT CO_2e and would not result in a significant impact related to GHG emissions.

Hazards Related to Climate Change

The San Diego Foundation's Regional Focus 2050 Working Paper and Technical Assessment projected potential adverse effects on the San Diego region related to climate, energy need, public health, wildfires, water supply, sea level, and ecosystems. The following analysis discusses potential hazards related to climate change that the VWD service area may be subject to in the future.

Warming across San Diego County is projected to increase 1.5 °F to 4.5 °F between the years 2000 and 2050. Warmer temperatures would increase the peak demand for electricity and could result in blackouts and power outages. However, the 2008 Master Plan does not include any structures that would be used for human occupation. The proposed CIP projects would potentially result in an increase electricity demand during higher temperatures because water use rises with temperature and may require an above average amount of pumping operations. However, as discussed in Section 3.3.5.5,

Table 4.6-5 GHG Emission Reductions Estimates for Master Plan CIP Project-Incorporated Measures

CAPCOA Measure	CAPCOA Estimated Reduction	Master Plan CIP Project Features That Would Implement Strategy	Project Reduction Estimate
Electricity Use Measures			
Install Energy Efficient Appliances	2-4%	CIP projects featuring electric pumps and motors, which include PS-1, PS-2, PS-3, PS-4, PS-5, PS-6, PS-7, PS-8, and SB-1, will use high efficiency pumps and motors that meet or exceed the energy efficiency levels listed in the National Electric Manufacturers Associations (NEMA) MGI-1993 publication. According to the CEC, energy efficient motors are 2 percent to 8 percent more efficient than standard motors (CEC 2010).	2%
Install Higher Efficacy Public Street and Area Lighting Limit Outdoor Lighting Requirements	16-40% of emissions from electricity required for lighting	All outdoor security lighting installed at the above-ground CIP facilities (i.e., storage reservoirs/tanks and pump/lift stations) under the 2008 Master Plan will use advanced fluorescent interior lighting, high-intensity discharge outdoor lighting, and lighting controls such as timers or motion detectors. Lighting would only be used when personnel are onsite at night and lighting is required. Lighting adjacent to native vegetation communities will be of low illumination, shielded, and directed downwards and away from these areas to avoid potential impacts to nocturnal wildlife from increased predation that would occur from "spill-over" of nighttime light levels into the adjacent habitats.	2%[1]
Total Estimated Reduction in Electricity and Diesel Use Emissions			**4%**

(1) Due to the small portion of electricity usage than can be attributed to lighting rather than operation of pumps, two percent is considered an appropriate reduction from total electricity emissions.

Source: California Air Pollution Control Officers Association (CAPCOA), Quantifying Greenhouse Gas Mitigation Measures, A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures, August 2010

Table 4.6-6 Estimated GHG Emission Reductions with Project Features

Use	Business as Usual Emissions (metric tons CO2e)	Project Reduction Estimate[1]	Emissions with Incorporation of GHG-Reducing Features (metric tons CO2e)
Electricity Use	606	4%	582
Diesel Usage (Emergency Generators)	10	0%	10
Mobile (Vehicle use)	56	0%	56
Construction	239	0%	239
Total Project Emissions	**911**	**2.6%[2]**	**887**

(1) Sum of the measures listed in Table 4.6-5

(2) Percent change from total BAU GHG emissions to GHG emissions total with incorporation of CAPCOA measures

Project Design Features, VWD would require all pumps to use high efficiency pumps and motors that meet or exceed the energy efficiency levels listed in the National Electric Manufacturers Associations (NEMA) MGI-1993 publication. Therefore, the CIP projects would not result in an increased number of blackouts as result of increased peak energy demand.

Regarding public health, increases in ozone air pollution levels as a result of climate change could exacerbate asthma and other respiratory and cardiovascular diseases. Fire-related injuries and death are likely to increase as intense wildfires occur more frequently. Additionally, cases of mosquito-related diseases could increase, and algal blooms with toxic bacteria could occur more frequently along the coast. As discussed in Section 4.1 (Air Quality), with implementation of mitigation measures Air-1 the proposed Master Plan would not exceed the screening-level criteria threshold for ozone precursors (NO_x and VOCs) during construction or operation. Therefore, the 2008 Master Plan would not significantly increase exposure to health risks from ozone. Exposure to fire risk would not increase because the Master Plan does not propose any structures for occupancy and would make water sources more reliable for fire fighting. The westernmost portion of the VWD service area is located more than four miles inland and would not be exposed to algal blooms in the ocean. The proposed Master Plan would not result in an increased exposure to public health concerns.

It is estimated that San Diego County could face an 18 percent shortfall in water supply by 2050. However as discussed in Section 5.2 (Utilities and Service Systems), the proposed Master Plan would be responding to projected growth in the region. It would not result in the need for new or expanded water and sewer supplies.

Rising sea levels have the potential to result in high tide flooding, cause even greater coastal erosion and scouring, and put pipelines at risk for saltwater intrusion. The VWD service area is located more than four miles inland. The westernmost CIP project, the outfall alignment, would terminate at the Encina Waste Water Treatment Plant, located approximately 1,050 feet inland. At this distance from the Pacific Ocean, the outfall alignment would not be at risk for flooding, scouring, or saltwater intrusion. Therefore, the CIP projects are not at risk from rising sea level elevations.

Climate change will also add to the pressures on the variety of habitats and species in the county. As discussed in Section 4.2 (Biological Resources), the proposed Master Plan would mitigate all of its potentially significant impacts to biological resources to a less than significant level. Therefore, the proposed Master Plan would not result in the increased exposure of biological resources to risks from climate change.

Mitigation Measures

Implementation of the Master Plan would not result in GHG emissions that would result in a significant impact on the environment or conflict with an applicable plan. This impact is less than significant; therefore, no mitigation is required.

4.6.4 Cumulative Impacts

Due to the nature of assessment of GHG emissions and the effects of climate change, impacts can currently only be analyzed from a cumulative context. Therefore, the analysis provided above includes the analysis of both the Master Plan and cumulative impacts.

4.6.5 CEQA Checklist Items Deemed Not Significant or Not Applicable to the 2008 Master Plan

All CEQA checklist items under the category of Greenhouse Gas Emissions were adequately addressed in this section.

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